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# OR18/1187

## Why are plants smelly?

Ever trod on a plant, caught a whiff of its smell and wondered: why do plants smell? Well, wonder no more, we have just the thing for you: our “why are plants smelly” outreach project. We seek funding to support activities as part of University of Reading's (UoR) contribution to British Science Week (BSW: March 2019) and fifth international "Fascination of Plants Day" (FoPD: May 2019). These events also contribute to UoR's 50th anniversary celebration of Masters botany showcasing 50 years training, inspiring and enthusing new botanists. We give school and general public audiences total immersion in smelly plants, scratching and sniffing them, and discussing the phytochemical basis of different plant aromas, both sweet and stinky, their ecological roles in plant defence and pollination, and human dimensions: food, medicines, health and therapy.

This project reflects the goals of the BES outreach grant to: (1) increase understanding and engagement with ecology through hands-on investigation of ecological photochemistry and its role in pollination and herbivory, (2) inspire and enthuse people about ecology through engaging scientific curiosity with plants and, (3) develop skills in communicating ecology to audiences and also legacy elements: blog posts, post-project video.

We invite diverse groups to the University's prize-winning green campus and its hidden green gem the Harris Garden to get seriously curious about stinky plants! We challenge participants by asking how many smelly plants are there and how many different smells? What makes plants smell and what do the smells do for the plant? Why do some plants smell nice while others stink and can we eat both kinds? And can plants smell each other?

Activities include photographs, living plant material and aromas isolated from plants. Participants will use hand lenses to get up close and intimate with plants and their aromas and more detailed explorations using a digital microscope and projector. Investigations include (1) Scratch and sniff: hands-on experience of smelly plants and discussing the responsible phytochemicals and how some aromas attract pollinators, while others help defend the plant from herbivory and how some of these have medicinal and therapeutic values. (2) Smelly Families: A range of “smell pots” (isolated plant aromas in plastic pots) will be presented with photographs of plants and living plant material, the challenge is match the aromas with the plant. We then ask which plant families include aromatic, are there family-specific smells and associated chemicals, what is their ecological function, are there culinary and medical properties? (3) Attraction and repulsion: Pleasantly aromatic flowers and stinky plants will be used to stimulate discussion on different smells plants produce and the animal pollinators etc. that receive them and whether these are 'come hither' or 'naff off' signals!

Some of the events will end with a live video relay with participants summarising what they have discovered via the online video platform periscope. Log posts and a post-project YouTube video “Why are plants smelly?” will be produced from material filmed on the days using video and a 360 degree camera to capture the activities.

## PRIMARY APPLICANT DETAILS

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Name [REDACTED]  
Surname [REDACTED]  
Website (Work) [REDACTED]  
Tel (Work) [REDACTED]  
Email (Work) [REDACTED]  
Address [REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]

## Section 1 - Eligibility

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Please answer the questions below to determine if you are eligible for this scheme

Please note we do not accept resubmissions of the same project. Applications will be rejected without being sent out for review if they are re-submissions of a proposal rejected in a previous round, or if they represent only a minor revision of such a proposal (for example, with a modified experimental design). As a guide, in order to be significantly different, at least 80% of objectives & activities should be different to the original proposal.

Using the above statement, is this project a resubmission?

No

## Section 2 - Contact Details

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### PRIMARY APPLICANT DETAILS

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Name [REDACTED]  
Surname [REDACTED]  
Website (Work) [REDACTED]  
Tel (Work) [REDACTED]  
Email (Work) [REDACTED]  
Address [REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]

### GMS ORGANISATION

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Type	Organisation
Name	[REDACTED]
Phone	[REDACTED]
Email	[REDACTED]
Address	[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

If you do not have a current organisation (i.e. you are an independent researcher/retired), please provide your preferred contact address above and select the checkbox to the right.

Unchecked

### BES Membership Number

You do not need to be a member to apply, however if you are, please provide your number below

[REDACTED]

## Section 3 - CV

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[REDACTED]

[REDACTED]

If you are applying on behalf of an organisation, please provide a brief background:

[Redacted]

[Redacted]

[Redacted]

Please complete the below details for the lead applicant involved in the project.

Please provide details of previous experience organising events aimed at engaging the public with science:

We regularly carry out outreach activities at [Redacted] with the emphasis on countering so-called plant-blindness, and inspiring and enthusing people of all ages about the beauty, fascination and importance of plants and plant ecology. We also aim to increase public understanding of, and engagement with plants and the critical importance of plants to society and for a sustainable biosphere. Examples include: Fascination of Plants day 2015 with botanical spotlight on the Monkey Puzzle tree and engagement with fossil remains, living plants and current conservation dilemmas. For FoPD 2017 we invited local schools to take part in three tasks: tropical plants edible or poisonous? What plants have you used today? and how many plants are there? We have also taken outreach activities into local schools with topics like "What plants would you take to Mars?" and "How and why do we classify plants?" We regularly welcome school and adult groups to the UoR tropical glasshouse where groups get to see a variety of tropical plants and think about poisonous and edible plants. Cafe Scientifique is a UoR outreach activity taking science to the public through informal sessions in local pubs and in 2015 we tackled the issue of "plant blindness" amongst the human species. Alongside these activities we publish a range of blogs and web platforms to promote interest in plant taxonomy, ecology and conservation. Here are some examples:

[Redacted]

Education History

Please note if you do not know the exact day, select the 1st day of the month e.g. March 2005: 01/03/2005

Start Date	End Date	Qualification	Organisation	Additional Info
[Redacted]	[Redacted]	BSc Hons Botany	[Redacted]	[Redacted] Response
[Redacted]	[Redacted]	PhD	[Redacted]	No Response
[Redacted]	[Redacted]	Post Doc	[Redacted]	No Response
[Redacted]	[Redacted]	Post Doc	[Redacted]	No Response

Employment History

[Redacted]

[Redacted]

Please note if you do not know the exact day, select the 1st day of the month e.g. March 2005: 01/03/2005

Start Date	End Date	Position	Organisation	Additional Info
[REDACTED]	[REDACTED]	Lecturer in plant ecology	[REDACTED]	No Response
[REDACTED]	[REDACTED]	Associate Professor of Field Botany	[REDACTED]	No Response
[REDACTED]	[REDACTED]	Senior Botanical Consultant	[REDACTED]	No Response

### Awards/Achievements/Skills

[REDACTED] Identification Skills Certificate (FISC) [REDACTED]
No Response
No Response

### Summary of Publication Record (If relevant)

I have more than 80 publications including 35 peer-reviewed papers with 1509 citations 520 since 2008.

More info here: [REDACTED]  
[REDACTED]

### Additional Information

Website: [REDACTED]  
Twitter: [REDACTED]

## Section 5 - Project Details and Keywords

**NB: The Total Project Cost and Amount Requested will be added automatically from the figures you provide on the budget page. Once you have completed your budget, you will be required to come back into this page, ensure the figures are correct, and save the page.**

### Summary Project Details

<b>Total project cost: £</b> 1,975.00	<b>Amount requested from BES: £</b> 1,975.00
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## Please read our [Bulletin article](#) for guidelines on writing an effective lay summary.

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### Project title:

Why are plants smelly?

### Project lay summary:

Ever trod on a plant, caught a whiff of its smell and wondered: why do plants smell? Well, wonder no more, we have just the thing for you: our "why are plants smelly" outreach project. We seek funding to support activities as part of University of Reading's (UoR) contribution to British Science Week (BSW: March 2019) and fifth international "Fascination of Plants Day" (FoPD: May 2019). These events also contribute to UoR's 50th anniversary celebration of Masters botany showcasing 50 years training, inspiring and enthusing new botanists. We give school and general public audiences total immersion in smelly plants, scratching and sniffing them, and discussing the phytochemical basis of different plant aromas, both sweet and stinky, their ecological roles in plant defence and pollination, and human dimensions: food, medicines, health and therapy.

This project reflects the goals of the BES outreach grant to: (1) increase understanding and engagement with ecology through hands-on investigation of ecological photochemistry and its role in pollination and herbivory, (2) inspire and enthuse people about ecology through engaging scientific curiosity with plants and, (3) develop skills in communicating ecology to audiences and also legacy elements: blog posts, post-project video.

We invite diverse groups to the University's prize-winning green campus and its hidden green gem the Harris Garden to get seriously curious about stinky plants! We challenge participants by asking how many smelly plants are there and how many different smells? What makes plants smell and what do the smells do for the plant? Why do some plants smell nice while others stink and can we eat both kinds? And can plants smell each other?

Activities include photographs, living plant material and aromas isolated from plants. Participants will use hand lenses to get up close and intimate with plants and their aromas and more detailed explorations using a digital microscope and projector. Investigations include (1) Scratch and sniff: hands-on experience of smelly plants and discussing the responsible phytochemicals and how some aromas attract pollinators, while others help defend the plant from herbivory and how some of these have medicinal and therapeutic values. (2) Smelly Families: A range of "smell pots" (isolated plant aromas in plastic pots) will be presented with photographs of plants and living plant material, the challenge is match the aromas with the plant. We then ask which plant families include aromatic, are there family-specific smells and associated chemicals, what is their ecological function, are there culinary and medical properties? (3) Attraction and repulsion: Pleasantly aromatic flowers and stinky plants will be used to stimulate discussion on different smells plants produce and the animal pollinators etc. that receive them and whether these are 'come hither' or 'naff off' signals!

Some of the events will end with a live video relay with participants summarising what they have discovered via the online video platform periscope. Log posts and a post-project YouTube video "Why are plants smelly?" will be produced from material filmed on the days using video and a 360 degree camera to capture the activities.

### Project start date:

04/03/2019

### Project end date:

28/06/2019

### Project country:

United Kingdom

**We have chosen a selection of keywords, which cover the breadth of the ecological research we fund. These keywords link the ecological content of an application to the most appropriate member of the BES Review College.**

**As your selections will determine which reviewers are asked to assess your application, please select carefully.**

### Please choose three words from the following:

- Biodiversity
- Plant Ecology
- Pollination ecology

## Section 6 - Grant Specific Questions

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**Please provide a description of the project (including details on any materials being produced and who is responsible for preparing these), the key aims and how it will meet the objectives of the Outreach Grant:**

- (1) Encourage appreciation and enthusiasm for plants and counter plant blindness through total immersion in plants and ecological biochemistry.
- (2) Showcase the diversity of smelly plants and the different types, origin and significance of plant aromas.
- (3) Highlight the biochemical basis and ecological biochemistry of plant aromas, e.g. attracting pollinators and repelling herbivores and pathogens.
- (4) Expand awareness of the work of Jeffrey Harborne and plant ecological biochemistry.
- (5) Enhance awareness of human uses of aromatic plants in food, medicines and therapy.

We will develop activities for use at British Science Week and based on that experience develop them further for Fascination of Plants Day.

(1) Scratch and sniff: Examples of aromatic plants will be provided and examined scratched, sniffed, and generally pulled apart by participants to experience the responsible phytochemicals and discuss how these help defend the plant from herbivory and also which may produce medicinal compounds. (2) Smelly Families: A range of aromatic plants will be available as photographs, living plant material and bottled aromas, participants will be challenged to match the aromas with the plant. Following this will be discussion of which plant families include aromatic plants, whether there are family-specific smells and associated phytochemicals and their ecological function, and culinary and medical properties. (3) Lemon-scent: A range of plants from diverse families which all smell of lemon will initiate discussion on the nature of the aroma, its ecological function and the value in different cuisines. (4) Attraction and repulsion: Pleasantly aromatic flowers and stinky plants will be used to stimulate discussion on different smells plants produce and the pollinators etc. that receive them and whether these are 'come hither' (attraction) or 'naff off' (repelling) signals! Attracting pollinators: Images and living or dead material will be provided of different flowers and pollinators and participants asked to match the pollinators with the flowers. Repelling herbivores and pathogens: Images and living material of a range of smelly plants will be provided and participants will be asked to rank them in order of likeliness to be eaten by a range of animals including humans. The work of Jeffrey Harborne on phytoalexins, present in several families of vascular plants and which provide protection against plant pathogens, will be show-cased here.

Activities will be prepared and participants will be grouped with a leader and an assistant and will engage with these in rotation providing an opportunity to investigate each activity.

**Please provide information on the target audience and how you will advertise/promote the event to them:**

British Science Week with Reading branch of BSA on campus 9-18th March focus Key Stage 3 Students Year 7, 8 and 9 marketed directly to schools. Also targeting family audiences advertised using social media, event listings, local TV and radio and the British Science Week events website.

Fascination of Plants day 15 May 2019 with morning (local Primary schools) and afternoon (adult special interest groups) events in the Harris garden. Including: Natural History Society, Allotment and Gardeners Associations and Friends of the Harris Garden. Advertised by direct contact via web and UoR Events calendar and the national FoPD website.

**Please provide information on the expected audience size:**

For British Science Week 100 tickets will be issued for schools/families.

For Fascination of Plants Day morning event two invited primary school groups ca. 50, afternoon special interest adult groups approx. 50.

The total audience will be significantly augmented by others interacting with the blog posts and post-project legacy video.

**Please outline the expected results and how the project will be evaluated:**

The project team: [REDACTED]

Data, results and project evaluation will use embedded evaluation (e.g. questionnaires), photo-elicitation (before and after examination of images) and observational evaluation during the events (e.g. open and closed questions to measure engagement).

Examples: Before and after image exercises to evaluate shifts in perception of the importance of plants as central or peripheral elements compared to animals and plants as critical providers of pollen. Schools will be asked to list the smelly plants they know and we will evaluate the range, the gaps and the cultural context of this knowledge.

Data collection e.g. how participants respond to questions such as why plants smell sweet or nasty and implications for pollination, anti-herbivore and anti-pathogen responses and potential evolutionary "arms-races". Evaluation of the human dimension such as implications of smelly plants for edible, medicinal and therapeutic uses.

Other data comes from events feedback forms, summary cameos on feedback sheets and the concluding Periscope video, online stats e.g. likes, and retweets of our twitter activity using #smellyplants, quantitative stats from views, likes and qualitative analysis of comments on our post-project YouTube legacy video.

**What are the risks to the health and safety of those involved in the project and how are these risks to be minimised?**

The University [redacted] safety officer and the Outreach Office will help us prepare a Risk Assessment detailing potential hazards, including plant hazards, and how we will deal with these. Elements included will be: Handling plant materials, slips trips and falls. For the events qualified first-aiders will be present at all events. The UoR Outreach Office has wide experience of health and safety issues surrounding outreach events.

**Is there an admission fee?**

No

**Please indicate how you will assess the impact of the project, and which metrics you will use to assess the project's expected impact and benefits. What are the benefits for non-academic audiences, what data will be collected and what legacy will it leave?**

Impact evaluation based on written outputs, quantitative and qualitative data and communication. Before and after data analysed per audience and event, measuring e.g. shifts in perception and specific and general knowledges. Potential to enhance future outreach projects, interaction with other institutes and organisations, publications.

Metrics: Written material: BES project report, articles e.g. BES bulletin, online platforms e.g. week in botany. Potential new grant applications e.g. New Phytologist Trust innovation awards. Data: Raw data and value-added data products including potential contributions to plant projects for Science and Plants for Schools (SAPS). Communications: Events blog posts, articles/reports in local newspapers, social media (twitter etc), post-project legacy video, public talks and presentations. Self-evaluation discussions and development of models for effective outreach projects.

Benefits to non-academic audiences include extending dialogue between researchers and local special interest groups hosting "Ask the expert" style events which could lead to co-development of research questions and longitudinal evaluation to assess impact.

Data to be collected from embedded evaluation, photo-elicitation and observational evaluation during the events.

Legacy: Retrospective blog post including evaluation results. cross-blogged over lead academics personal blog, University Connecting Research blog and the department's blog. The activities are designed to be replicated at other events e.g. Royal Berkshire Show, workshops for key stage 3 students delivered by the Outreach Team. YouTube legacy video "Smelly plants" including footage of events, tracing themes and outcomes and wider subject matter. Development of future effective outreach projects and grant application, interaction between schools at UoR and with external organisations.

**Please indicate how you will promote the BES if your proposal is funded**

BES will be acknowledged using the recognised logo or hashtag etc as appropriate in all the web-based publicity and reporting e.g. Twitter (@BritishEcolSoc), Facebook and blog posts and in the credits on the on the post-project legacy YouTube video. The BES logo will also appear on the branded merchandise e.g. the hand-lens lanyards.

**Have you previously applied for a grant from the BES?**

Yes

**If you would like to upload a document in support of your application please attach using the control below. Please make sure you reference these in your text.**





**NB: A maximum of 1 file can be uploaded. Please only upload files essential to the application. Files with additional text to supplement word limits will not be considered and may make your application ineligible.**

*No Response*

## Section 7 - Budget

Please note all budgets must be provided in Great British Pounds (GBP)

Item	Description	Total Cost
Fascination of Plants banner	Banner explaining the themes of the project in the context of FoPD, this will be designed to be date neutral for use beyond the project lifetime (legacy item)	£200.00
Transport assistance for local schools/groups	Bus fares and subsidy for lower income bracket schools	£100.00
150 x10 magnification hand lenses by Galloways	Hand lenses (legacy item)	£500.00
150 lanyards with BES and UoR logos	The lanyards will be attached to the plastic hand lenses which will be handed out to participants, and can be taken away after to as a tool for future investigation and a legacy of the project	£100.00
Range of free items for use by participants	Pencils and notebooks and stickers for use by participants and more widely to enhance the project reach (legacy items)	£100.00
Refreshments for events	Tea, coffee, squash and biscuits, paper plates and napkins	£50.00
Post-project video production	A YouTube video on the topic "Why do plants smell?" will take the viewer on a short journey including footage from our events on the nature, origin and significance of plant aromas, requires 10 hours of video filmographer £70 per hour (legacy item)	£700.00
Aroma pots	Ten sets of ten plastic pots with perforated lids for our own and commercial aromas for use in the activities (legacy item)	£50.00
Bespoke aromas	We will purchase commercial aroma sprays for selected aromas to ensure robust lasting aroma for use in some of the activities, ten aromas at £10 pp (legacy item)	£100.00

Seeds and other plant materials      For selected aromatic species which      £75.00  
we do not have at UoR we will  
purchase and grow up seeds or  
plantlets in the UoR glasshouses for  
the events

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**Overall Total Costs: £**  
1,975.00

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**Total project cost:**  
**£**  
1,975.00

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**Amount Requested from BES**  
£1,975.00

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**If the total cost of the event is greater than the amount sought from the BES, please state how the balance will be met. If you have applied to other organisations for funding, please state which organisations, the amount and the result (if known). If you are not successful in these applications, please state how the shortfall in funding will be met:**

n/a

**If the BES is only part funding this project the Society funding must be shown to add significant impact. Please indicate the benefits the BES funding specifically will contribute:**

n/a

[REDACTED]

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